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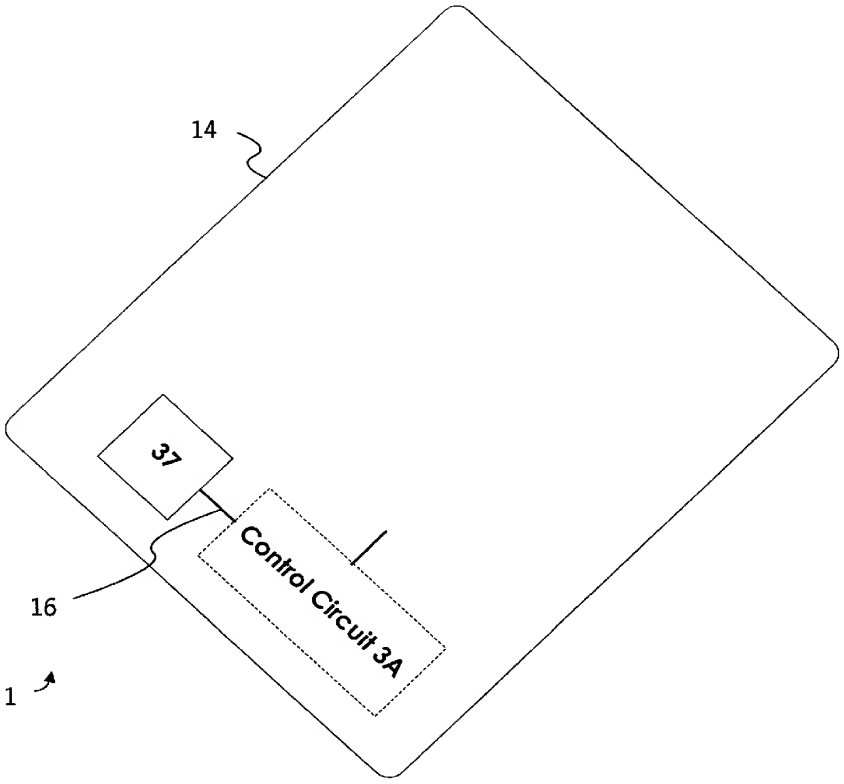
(54) Title: A TOUCH PAD THAT CONFIRMS ITS SECURITY



(57) Abstract: Apparatus and methods for secure data entry. The apparatus includes a device for entering data, a display for displaying information confirming the security of the data-entry apparatus and an encryption circuit, communicatively coupled to the data-entry device and the display. The device for entering data may be a touch pad. The first and second displays are physically separate and are under the control of respective controllers, in turn communicatively coupled to and under the control of the encryption circuit. The displayed information may be an icon. The data-entry apparatus refrains from displaying information asserting the device's ability to securely receive data. The data-entry device then prepares to receive encrypted data received. If then displays information asserting the data-entry device's ability to securely receive the data.

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A TOUCH PAD THAT CONFIRMS ITS SECURITY

This invention relates to the touch pads, display, touchscreens and secure data entry. More particularly, the invention relates to confirming to the user the security of data to be entered on a touch pad during, for example, a consumer transaction.

This application claims the benefit of the following application:

U.S. Patent Application No. 60/252,800, entitled, "A Touch Pad that Confirms its Security," filed November 21, 2000, naming G.F.R. Sulak Soysa et al. as inventors, with Attorney Docket No. A-70049/MAK/LM and commonly assigned to @pos.com, Inc. of San Jose, California.

U.S. Patent Application No. 60/252,800 is incorporated by reference herein.

RELATED APPLICATIONS

This application is related to:

U.S. Patent Application No. 09/588,109, entitled, "Secure, Encrypting PIN Pad," filed May 31, 2000, naming James C. Lungaro, Susan W. Tso, Llavanya Fernando and Simon Lee as inventors, with Attorney Docket No. A-68938/MAK/LM and commonly assigned to @pos.com, Inc. of San Jose, California.

U.S. Patent Application No. 09/588,109 is incorporated by reference herein.

BACKGROUND

All of the credit- and debit-card companies are experiencing high levels of fraud, including Visa International, MasterCard International, American Express Company and Discover Bank. The ease of circumventing the hardware or software security of a PIN entry device has contributed to this fraud over the last ten years. Visa and MasterCard project an increase of annual losses on credit and debit cards of $843.2 million in 2001 to $2.13 billion by 2010. Accordingly, the payment companies are requiring stricter security — both physical and logical — for payment devices.

Older conventional devices for debit transactions are physically and logically secure. Tamper-detect switches inside a device including a casing erase valuable information if the casing is broken. Security grids and ruggedized security shrouds prevented drilling into the device. Logical security measures manage cryptographic keys (to encrypt PIN numbers) and transaction data within the device. Additionally, the logical security ensures message authentication coding during message transit.

The advent of reliable and less expensive LCD and touch-screen technologies brought the corresponding evolution of newer payment devices that incorporated the technologies --- payment terminals, personal digital assistants (PDAs), and Internet appliances, for example. These newer devices enable customers to interact with the devices during transactions. However, the transactions from such devices are not as secure (physically or logically) as those from the older devices.

One such newer device is the iPOS TC transaction terminal available from the Assignee of the instant invention. The iPOS TC is a web-enabled payment device for secure debit and credit transactions. Dual channels securely simultaneously transmit electronic transaction and signature data on one channel and advertising and promotional media from the World-Wide Web (the web), on the other.

These newer devices are more programmable and have more functionality than the older conventional devices. Because of their status on the web, however, they are increasingly susceptible to attacks by hackers. These malfeasants may re-program the device, for example, to make information normally encrypted appear in the clear or to display rogue keypads, thus compromising security.

Accordingly, there is a need in the art for a payment device that protects against a user entering information on a rogue keypad, thus reducing the chances of fraudulent activity from the device.

These and other goals of the invention will be readily apparent to one of ordinary skill in the art on reading the background above and the description below.

BRIEF DESCRIPTION OF THE DRAWINGS

Figures 1 and **2** illustrate the touch pad of a payment device, according to one embodiment of the invention.

Figure 3 illustrates the circuitry of a payment device, according to one embodiment of the invention.

(The drawings are not to scale.)

DESCRIPTION OF THE INVENTION

Figure 3 illustrates the circuitry **3** of a payment device according to one embodiment of the invention. The circuitry **3** includes a microprocessor **31**, an encryption circuit **32**, a MSR circuit **33**, a signature-capture circuit **34**, first and second display controllers **35, 3B**, a touch-pad controller **36**, a security-icon display **37**, a touch pad **1** and a (general) display **39**.

The microprocessor **31** communicatively couples to the encryption circuit **32**, the MSR circuit **33**, the signature-capture circuit **34** and the display controller **35**. The encryption circuit **32** communicatively couples with the display controller **3B** that itself communicatively couples

with the security display **37**. The display controller **35** and the (general) display **39** communicatively couple. The encryption circuit **32** communicatively couples with the touch pad controller **36** that itself communicatively couples with the touch pad **1**.

U.S. Patent Application No. 09/588,109 describes an encryption circuit **32**. That encryption circuit **32** may include a CPU, a memory, a touch-pad interface and a POS-system interface (all not shown here). The memory of the encryption circuit **32** may be programmed to perform the invention as described herein, including receiving, converting and encrypting input from the controller **36**. Alternatively, the encryption circuit **32** may include an application-specific integrated circuit (ASIC) or other hardware for performing encryption.

The controllers **32, 33, 34, 35** and **36** are preferably within a single chip **3A** (which also has a microprocessor as described above). Alternatively, a chip with an embedded microprocessor and other components (such as a digital-signal-processor block) to implement the various algorithms described herein) may be used instead. The Intel Xscale™ Microarchitecture from Intel Corp. (Santa Clara, California) is an example. (See http://developer.intel.com/design/intelxscale/index.htm.)

The circuit **3A** may be embedded using the chip-on-glass process known in the art. The circuit **3A** may be one or more ASICs.

Figures 1 and **2** illustrate the touch pad **1** of a payment device, according to one embodiment of the invention. The touch pad **1** may include a conductive flexible membrane **11**, insulated dots **18** and a rigid backer **14**. Between the membrane **11** and the rigid substrate **14**, the touch pad **1** may include the display **37**, control circuitry **3A** and a communications link **16.**

The display **37** may be one or more LCDs, one or more LEDs of the art or both.

The link **16** communicatively couples the control circuit **3A** and the display **37**.

In a process herein termed "keypad obfuscation," Lungaro et al., U.S. Patent Application No. 09/588,109, "A Secure, Encrypting PIN Pad," encrypts PIN pad data before the data travels beyond the PIN pad. The touch pad **1** described herein may apply keypad obfuscation to data entered on it. Data such as PIN and account numbers may be obfuscated, as may data for transmission to payment processors, keys for password verification and program validation, etc. The encryption circuit **32** may provide this service.

The signature-capture circuit **34** enables the device **1** to capture and validate signatures entered via the touch pad **1**.

For the benefit of a customer transacting business on a device incorporating the touch pad **1**, the encryption circuit **32** may direct the display controller **3B** to display an icon or other predetermined indicator visible to the customer on the display **37**. The encryption circuit **32** may do so when it has determined that data to be entered on the touch pad **1** will be secure. The visible indicator ensures the user that the device **1** is indeed secure for data entry.

Consider the use of an embodiment of the invention in a personal digital assistant (PDA). The touchpad would be used primarily for data entry (e.g., as a graffiti pad). In such cases, the encryption functions are not used. However, when the user wishes to perform a financial transaction, for example, the security functions are activated.

A typical transaction may progress as follows: When the user initiates a transaction, the microprocessor **31** initiates the display of, say, a virtual PIN pad on the display **39** by invoking a software routine, say, the Virtual PIN Pad routine (VPPR). Now the VPPR cues the security circuit **32** to initialize the security functions. Among the initializations is the display of the secure icon on the display **37**.

The VPPR cue to the security circuit **32** may include a binary code. If the security circuit **32** does not recognize the code, it does not

display the security icon on the display **37**. If a further level of security is deemed necessary, the original VPPR may have a code generator synchronized with the security circuit **32**. Then the binary coded cue changes each time it is generated.

Then the user enters PIN data which is directed to the cryptography block **32** for encryption. Thus, information leaving the glass is encrypted.

A hypothesized hacker seeks to bypass the security block **32** to obtain unencrypted PIN data. Assume, arguendo, that he gains control of the microprocessor **31** and uses software of his design to mimic the actions of the original VPPR. He attempts to cue the microprocessor **32** to display the security icon.

Since the software in the payment device is compiled, the prospective hacker needs the original source code to identify and transmit the necessary binary code.

The ersatz VPPR has to generate the valid cue. If the security block **32** does not recognize the code proffered, it will not initiate the display of the security icon. The user recognizes the absence of the security icon and refrains from entering sensitive data (e.g., a PIN). Indeed, the encryption circuit **32** may initiate the disablement of the PDA.

The device **1** may have a separate visible indicator for each type of data that a customer may enter. For example, a first icon may indicate a device **1** secure for PIN entry, while a second different icon may indicate that the device **1** is secure for signatures. In addition or in the alternative, a single visible indicator may indicate that two or more types of data may be entered securely or that any of multiple types of data may be entered securely.

A visible security indicator is not part of the main display **39** of a touchscreen incorporating the touch pad **1** but is a separate display **37** under different control than the main display **39**. For example, the main display **39** of a touchscreen is typically under the programmatic control of

a processor **31** while the display **37** is under the control of the security circuit **32**.

Data entered on and encrypted by the touch pad **1** is made available to external processors by means of a communications link from the control circuit **3A**. This may be the "pigtail" of the art.

The class of devices incorporating a touch pad **1** may include point-of-sale (POS) devices, automated teller machines (ATMs), kiosks, mobile phones, keyboards, internet-protocol phones (Voice Over IP or VoIP), laptops and entertainment consoles. Payment terminals, internet appliances and PDAs have already been mentioned.

For merchants, a device incorporating a touch pad **1** helps to reduce the cost of a card-payment transaction. The physical security reduces or eliminates the opportunity for fraud. Touch-pad data — including PINs, passwords and signatures — are encrypted at the point-of-entry to ensure the security of this information and decrease the cost of the transaction.

The invention now being fully described, one of ordinary skill in the art will readily recognize many changes and modifications that can be made thereto without departing from the spirit of the appended claims.

WHAT IS CLAIMED IS:

1. A data-entry apparatus comprising:

a device for entering data;

a display for displaying information confirming the security of the data-entry apparatus; and

an encryption circuit, communicatively coupled to the data-entry device and the display.

2. The data-entry apparatus of claim **1**, wherein the device for entering data comprises

a touch pad.

3. The apparatus of claim **1**, further comprising a second display, and

wherein the first and second displays are physically separate.

4. The apparatus of claim **1**, further comprising a second display, and

wherein the first and second displays are under the control of respective first and second controllers that in turn are communicatively coupled to and under the control of the encryption circuit.

5. The apparatus of claim **1**, wherein the displayed information comprises

an icon.

6. A method for accepting data on a data-entry apparatus, the method comprising:

refraining from displaying information asserting a data-entry

device's ability to securely receive data;

then preparing to encrypt data received on the data-entry device;

then displaying information asserting the data-entry device's ability to securely receive data.

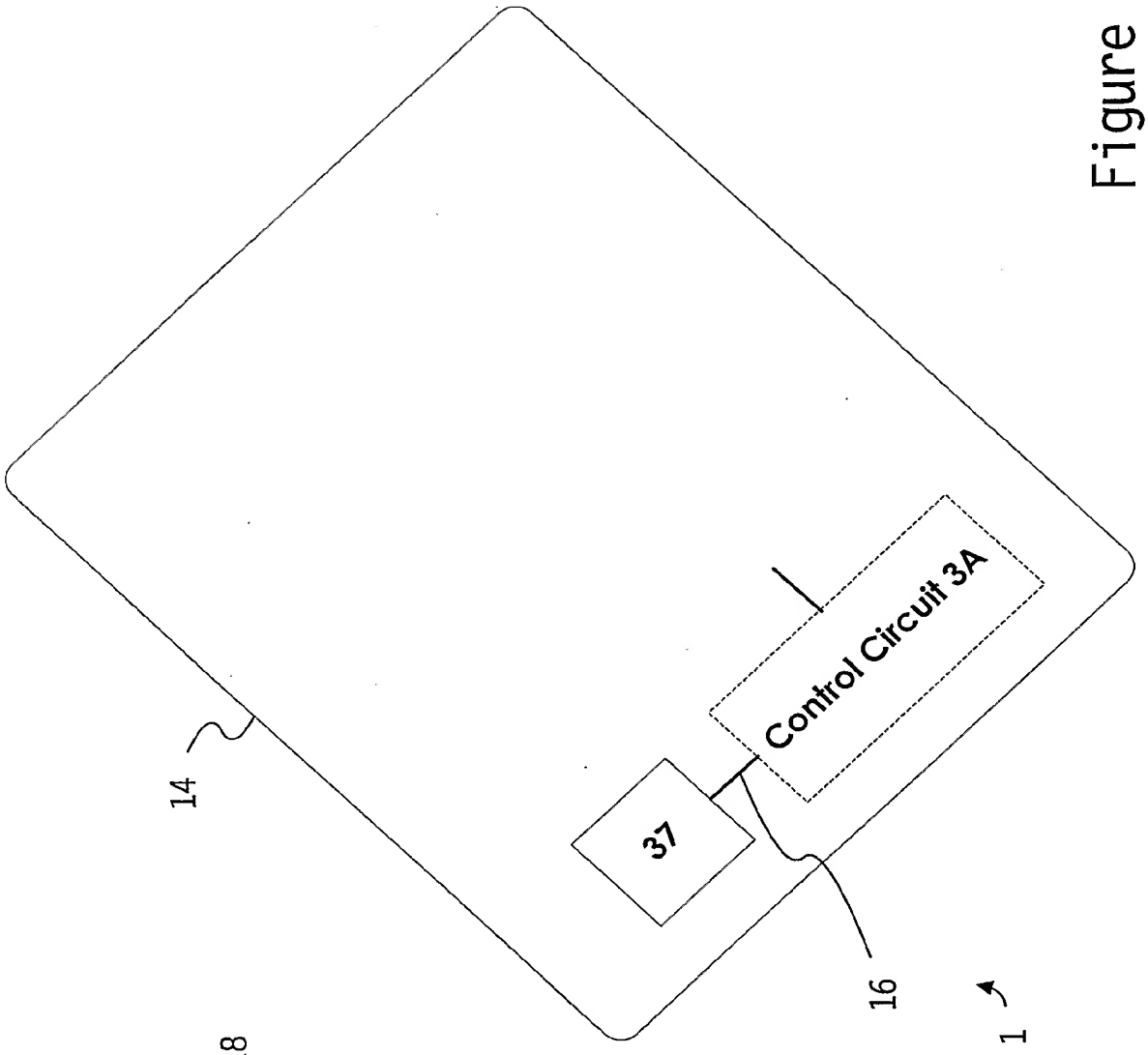

Figure 2

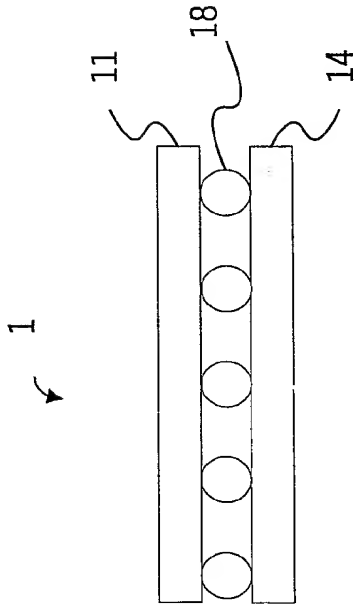

Figure 1

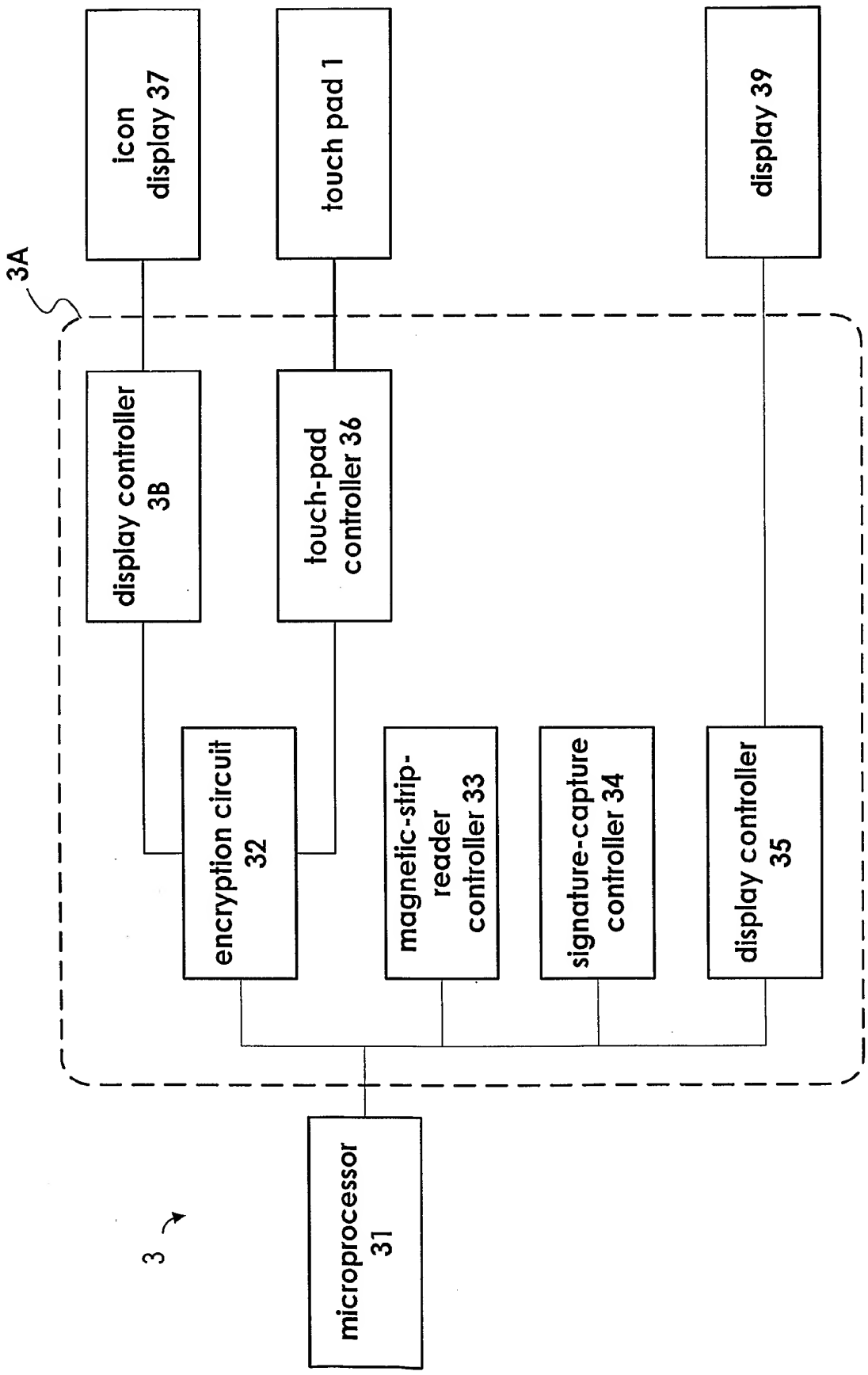
icon display 37
touch pad 1
display 39
3A
display controller 3B
touch-pad controller 36
encryption circuit 32
magnetic-strip-reader controller 33
signature-capture controller 34
display controller 35
microprocessor 31
3

Figure 3